

STATE OF NEW MEXICO

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

CASE 10,704

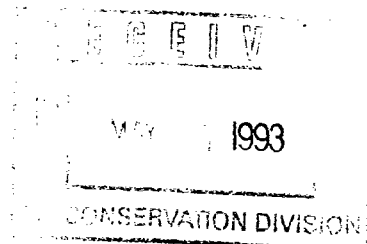
EXAMINER HEARING

IN THE MATTER OF:

Application of Marathon Oil Company to amend
Division Order No. R-9503 to increase the vertical
limits authorized for injection in certain
injection wells in a waterflood project, Lea
County, New Mexico

TRANSCRIPT OF PROCEEDINGS

BEFORE: DAVID R. CATANACH, EXAMINER

ORIGINAL

STATE LAND OFFICE BUILDING

SANTA FE, NEW MEXICO

April 8, 1993

A P P E A R A N C E S

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* * *

I N D E X

Page Number

Appearances

2

Exhibits

4

DONALD PRICE

Direct Examination by Mr. Kellahin

5

Examination by Examiner Catanach

24

ERIC CARLSON

Direct Examination by Mr. Kellahin

30

Examination by Examiner Catanach

35

DONALD PRICE (Recalled)

Examination by Examiner Catanach

36

Examination by Mr. Kellahin

38

Examination by Mr. Stovall

38

Further Examination by Examiner Catanach

40

Certificate of Reporter

42

* * *

1	E X H I B I T S	
2	APPLICANT'S EXHIBITS:	
3	Exhibit 1	7
4	Exhibit 2	8
5	Exhibit 3	9
6	Exhibit 4	10
7	Exhibit 5	12
8	Exhibit 6	12
9	Exhibit 7	13
10	Exhibit 8	17
11	Exhibit 9	17
12	Exhibit 10	19
13	Exhibit 11	22
14	Exhibit 12	22
15	Exhibit 13	23
16	Exhibit 14	31
17	Exhibit 15	31
18	Exhibit 16	31
19	Exhibit 17	32
20	Exhibit 18	33
21	Exhibit 19	34
22	Exhibit 20	40

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1 WHEREUPON, the following proceedings were had
2 at 11:01 a.m.:

3 EXAMINER CATANACH: At this time we'll call
4 Case 10,704.

5 MR. STOVALL: Application of Marathon Oil
6 Company to amend Division Order No. R-9503 to increase
7 the vertical limits authorized for injection in certain
8 injection wells in a waterflood project, Lea County,
9 New Mexico.

10 EXAMINER CATANACH: Appearances in this case?

11 MR. KELLAHIN: Mr. Examiner, I'm Tom Kellahin
12 of the Santa Fe law firm of Kellahin and Kellahin,
13 appearing on behalf of the Applicant, and I have two
14 witnesses to be sworn.

15 EXAMINER CATANACH: Any other appearances?

16 Will the two witnesses please stand and be
17 sworn in?

18 (Thereupon, the witnesses were sworn.)

19 DONALD PRICE,
20 the witness herein, after having been first duly sworn
21 upon his oath, was examined and testified as follows:

22 DIRECT EXAMINATION

23 BY MR. KELLAHIN:

24 Q. Please state your name and occupation.

25 A. My name is Donald Price, and I'm a reservoir

1 engineer with Marathon Oil Company.

2 Q. Mr. Price, on prior occasions have you
3 testified as a reservoir engineer before the Division?

4 A. Yes, sir, I have.

5 Q. Pursuant to your employment as a reservoir
6 engineer, have you made a study of the engineering
7 facts concerning Marathon's Application to increase the
8 permitted injection interval for these three injection
9 wells?

10 A. Yes, sir, I have.

11 Q. In fact, you testified as a reservoir
12 engineer in an earlier case on this very same topic,
13 did you not?

14 A. Yes, I have.

15 MR. KELLAHIN: Mr. Price, was an expert
16 witness, Mr. Examiner, in Case 10,443, resulted in
17 Order Number R-9503-A, and it dealt with one of the
18 injector wells in the southern portion of the project
19 area. This is a copy of that Order that this Examiner
20 had entered in that prior case.

21 We tender Mr. Price as an expert reservoir
22 engineer.

23 EXAMINER CATANACH: Mr. Price is so
24 qualified.

25 Q. (By Mr. Kellahin) Mr. Price, let me direct

1 your attention, sir, to Exhibit Number 1. Let us use
2 that display and have you give us a summary of what
3 this project is and then tell us what you seek to do
4 with this particular case.

5 A. Okay, what you see in Exhibit Number 1 is a
6 basic land plat of a portion of the South Eunice area
7 approximately six to seven miles south -- southwest out
8 of Eunice, New Mexico.

9 Shown here highlighted in -- bordered in
10 yellow, is Marathon acreage.

11 In Section 16 you can see where we initiated
12 a waterflood project in the South Eunice pool in the
13 fall of 1991. You can see symbolized are the injectors
14 and the producers.

15 As you move to the eastern edge of Section 16
16 or the western edge of Section 15, you can see in
17 question the three injection wells, Wells Number 33, 34
18 and 40, which are colored, and we are asking that the
19 stipulations that were put on these three injection
20 wells in the original Order be rescinded.

21 Q. Let me have you refresh the Examiner's
22 recollection of the reasons for the current stipulation
23 in the injection approval orders for those three
24 injectors.

25 A. Okay, in reference to the three injectors,

1 33, 34 and 40, vertical limit stipulations were placed
2 on these wells in reference to an agreement that we
3 made with Arco at that time.

4 At that time Arco operated the two Jalmat gas
5 wells in the western half of Section 15, which are
6 shown there in color, Well Number 15 and Well Number
7 23.

8 There was some concerns with the wellbore
9 condition and the Jalmat reserves, and we entered an
10 agreement with Arco at that time, upon initiation of
11 the original Order, that the vertical limits of
12 injected fluid would be the top of the Queen, which is
13 a member of the South Eunice Pool.

14 Q. What circumstances have changed with regards
15 to Arco's ownership of the Jalmat in the west half of
16 15?

17 A. Okay, shown here in Exhibit Number 2, if I
18 can direct your attention to that, we have -- We
19 entered negotiations, and after some long negotiations
20 with Arco, described here in Exhibit Number 2 from a
21 letter that we asked to be drafted by Arco, we made a
22 trade with Arco, and we now possess the rights and the
23 operatorship of the two wells in the western half of
24 Section 15, which would be, i.e., Well Number 15 and
25 Well Number 23.

1 Q. Have you caused Marathon to examine the issue
2 of ownership to determine whether or not there is any
3 correlative-rights issue concerning the owners of the
4 Jalmat gas reserves in the west half of 15, versus
5 those interest owners that control the oil production
6 and those reserves for the waterflood project?

7 A. Yes, sir, I have. And if I can direct your
8 attention to Exhibit Number 3, upon investigation by
9 our land department it is shown that all rights in the
10 Jalmat in the western half of Section 15 and the South
11 Eunice pool are a hundred percent working interest,
12 which is owned by Marathon, and that net revenue is
13 87.5, of which the other royalty, 12.5-percent, goes to
14 the State.

15 The State Land Office was contacted, and
16 since these are covered by one lease, there's no
17 difference in the State beneficiary between the Jalmat
18 zone and the South Eunice pool.

19 Q. Let's direct your attention, first of all, to
20 any potential issues concerning the relationship of the
21 injectors to the first Jalmat gas well in the west half
22 of 15, up in unit letter C. It's the Number 23.

23 A. That's correct.

24 Q. Have you examined that issue?

25 A. Yes, I sure have. If I could direct your

1 attention to Exhibit Number 4, what Exhibit Number 4
2 shows is a wellbore comparison of one of the injection
3 wells in question, which is labeled in blue, Well
4 Number 40, and is a wellbore comparison of the porosity
5 logs for Well Number 40 and one of the Jalmat gas
6 wells, which is Well Number 23, which is shown in
7 yellow on the map.

8 What I'm wanting to show here with this
9 exhibit is that you can see Well Number 23 was drilled
10 solely and only as a Jalmat well and is only completed
11 in the Jalmat zone and was never drilled down through
12 or penetrated the South Eunice pool, which is the zone
13 that we're requesting vertical limits to be extended
14 in.

15 Q. Let's use this display to orient the Examiner
16 as to the intervals that are contained when we describe
17 the political boundaries of the South Eunice pool.

18 A. Okay. Shown on Well Number 40, you can see
19 the Jalmat pool, which runs approximately 3300 feet
20 down to approximately 3690.

21 The way the pool rules are established, the
22 South Eunice Pool is the Queen Formation, plus the
23 bottom -- lower hundred feet of the Lower Seven Rivers
24 pool. So you take the top marker of the Queen and you
25 go up a hundred feet, and that establishes the top of

1 the South Eunice pool.

2 Q. What does the red line indicate on the
3 display?

4 A. The red line indicated on the display is the
5 zone, the main floodable zone that will be included if
6 these vertical limits are extended, which would be the
7 Lower Seven Rivers "A" zone.

8 Q. Currently you are permitted up to the top of
9 the Queen, but no farther?

10 A. That is correct.

11 Q. And by this Application, then, for injectors
12 on 40, 34 and 33, you are seeking to raise that limit a
13 hundred feet above the top of the Queen, so that the
14 fluid interval is consistent with the pool boundary?

15 A. That is correct. We request to go back to
16 the normal pool rules.

17 Q. Do you see any potential risk to the Jalmat
18 gas well, Number 23, if that request is approved?

19 A. No, I do not, based on the fact that 23 was
20 drilled only solely as a Jalmat well, and between 40
21 and 23 you do have a producer that is open in the Queen
22 and the Lower Seven Rivers pool.

23 Q. Are there any other wells around injector 40
24 that, in your opinion, would pose a potential risk that
25 injection fluids would migrate out of the pool into

1 other formations?

2 A. No, I do not.

3 Q. Identify for us Exhibit Number 5.

4 A. Exhibit Number 5 is a wellbore diagram taken
5 from completion and sundry notices on the McDonald
6 State "WN" Number 23.

7 This information was used to build the
8 information that's shown on Exhibit Number 4. It's
9 just more of a detailed information showing the casing
10 sizes, depths and a little history on what had been
11 done when the well had been fracture-stimulated.

12 Q. All right, sir. Now, Mr. Price, turn to
13 Exhibit Number 6 and identify and describe that.

14 A. Okay, Exhibit Number 6 is data that was
15 pulled off the *Dwight's* information system, and a
16 decline curve analysis was performed on Well Number 23,
17 and all I want to do is make the Examiner aware of the
18 cumulative production as of 1-93, which is 2.44 BCF.
19 The current rate is 275 MCF per day, and using an
20 economic limit of 30 MCF a day, there's approximately
21 1.49 BCF of recoverable reserves left in Well Number
22 23.

23 Q. This Jalmat gas well is one of the former
24 Arco wells that Marathon now operates?

25 A. That is correct.

1 Q. All right. Let's go down to the other Jalmat
2 gas well, the Number 15 well in the southwest quarter
3 of 15. Do you have a wellbore schematic of that well?

4 A. Yes, I do, as Exhibit Number 7.

5 Q. Identify the pertinent points of information
6 on that display for us, Mr. Price.

7 A. Okay, the pertinent points of information on
8 Well Number 15 is that we have established the top of
9 the Queen Formation as being 3715. That translates to
10 the top of the South Eunice pool, using a hundred feet
11 above the top of the Queen, being 3615.

12 Also shown there, it is established that the
13 Lower Seven Rivers "A" zone is at 3695.

14 The problem that was encountered with this
15 well, and led to some of the agreements with Arco, was
16 where the cement top was placed in this wellbore, as
17 far as protecting the Jalmat zone from injected fluids.

18 The well was cemented with 20 sacks of
19 cement. Using a 50-percent efficiency or a .5 safety
20 factor, using 9-5/8-inch casing in open-hole diameter,
21 you have a calculated cement top of 3680, which then
22 translates into a 15-foot cement zone above the top of
23 the Lower Seven Rivers "A" zone with a 50-percent
24 efficiency.

25 Also shown here on this wellbore schematic is

1 a calculated cement top of 3613, using again 20 sacks
2 of cement, but using a 75-percent efficiency, which is
3 a .25 safety factor.

4 Q. Now that Marathon controls not only the
5 injection wells and the producing wells in the Queen
6 flood, but the Jalmat Well Number 15, what is your
7 recommendation to the Examiner as to what to do with
8 relationships of both those two wells?

9 A. Okay, what Marathon proposes, in our opinion,
10 is based -- shown here with the wellbore diagram.

11 This well is a 1930-vintage well. It was the
12 original well drilled in the area. You have rip
13 casing. You can see there we have a cement plug from
14 3493 to 3523.

15 There's an unconfirmed depth of where the
16 packer is sitting, so you could have upwards of 150 to
17 200 feet of tubing and a packer in the hole.

18 It is our estimation that due to a calculated
19 cement top, that we very well could have cement above
20 to protect the Jalmat pool, that it is more risky at
21 this point in time to the reserves in that Number 15
22 well to go in and try to confirm the cement top and/or
23 put cement in that zone, versus going ahead and letting
24 the well produce as is until, if, and when we do see
25 breakthrough in that well.

1 Q. Because Marathon controls both the injector
2 and the Jalmat producer, do you subsequently ask in
3 your exhibits have a procedure that Marathon will
4 commit itself to, to undertake remedial action to
5 repair the Number 15 well in the event there is
6 breakthrough as a result of the flood?

7 A. Yes, we do have. That will be shown in
8 Exhibit Number 9.

9 Q. Describe for us the confidence you have as a
10 reservoir engineer concerning your calculation of the
11 cement tops, starting with the method in which this
12 well was drilled, the kind of formation it was drilled
13 in, to whether or not there's a confidence level as to
14 the calculation.

15 A. Okay. From drilling the wells in the unit
16 that were drilled in 1991, as you can see with this
17 wellbore diagram, it leads you to a few conclusions.

18 8-5/8-inch casing was set at 3089 feet.

19 6 5/8 was run to the setting depth of 3813.

20 So in the cement calculations obviously there
21 has to be -- the open-hole diameter has to be less than
22 the 8 5/8, so it was assumed to be 7 7/8. That could
23 not be confirmed, but it was the assumption that was
24 made in the calculations.

25 Also, it is our opinion that the .5 safety

1 factor, 50-percent efficiency, probably is very --
2 somewhat conservative, based on that you cut this zone
3 and you only went another 100, 200 feet, so you have
4 minimal exposure time between when this zone was cut
5 and when the cement was -- I mean the casing was run.
6 So you've probably got a lot better efficiency than the
7 .5 or the 50-percent efficiency on your cement, which
8 then warrants that the cement top is probably higher
9 than what we have here, the 3680.

10 Q. What is your concern as a reservoir engineer
11 to going into the 15 well now, doing remedial work and
12 doing new cement with regards to protecting the Jalmat
13 interval?

14 A. Moving on this well, definitely going to have
15 to drill out the cement, and then you could lead into
16 some fishing time on the tubing and, i.e., also the
17 packer.

18 This is a low-pressure gas zone, 200, 250
19 pounds, and it probably will lead to a prolonged
20 workover activity, which would mean a lot of kill
21 fluids and cementing exposed to that zone, which then
22 could put those reserves in jeopardy.

23 There again, we're looking at that -- We're
24 treating this that we'd rather not have to treat the
25 problem until we see it, if in fact we do ever see it,

1 than going ahead and risking the reserves right up
2 front and working on the well right away.

3 Q. Have you made an estimate as an engineer as
4 to the remaining recoverable reserves in the Jalmat
5 pool for the Number 15 well?

6 A. Yes, sir, I have, as shown in Exhibit Number
7 8.

8 Exhibit Number 8 is set up as Exhibit Number
9 6 is. It is *Dwight's Data*, pulled off the database. A
10 decline curve analysis has been used with the same
11 economic limit.

12 As you can see, cumulative production for
13 this well has been 4.48 BCF, current rate is 150 M a
14 day, and there's 402,000 MCF of reserves left in this
15 well projected for the economic life of the well.

16 Q. Let me have you describe for us the
17 recommended workover procedure you're requesting the
18 Examiner to adopt for the Number 15 well.

19 A. Okay. This is shown in -- The recommended
20 workover procedure shown in Exhibit Number 9.

21 Exhibit Number 9 shows that due to this being
22 low-pressure gas and fairly low volume, that we would
23 monitor daily gas production, wellhead pressure for
24 indications of any water entry. This is normal
25 operating procedure.

1 If water breakthrough would be incurred in
2 that well, if it would happen, the wellhead pressure
3 should drop and, i.e., the gas production should fall
4 of markedly.

5 Shown there in step number 2, appropriate
6 personnel within Marathon would be notified. And since
7 this procedure was put together, a workover rig would
8 be moved to do the following squeeze work within a
9 week.

10 Also, it's noted there that Account Injection
11 Wells 33 and 34, which are the two direct offsets,
12 would be shut in until all remedial work is said and
13 done.

14 Also, I'd like to point out in step number
15 22, after we do all subsequent squeeze repair work, all
16 this information will be forwarded to the NMOCD
17 District Supervisor and other Midland and Hobbs
18 personnel, and we would be in contact with the NMOCD to
19 see if remedial work is sufficient before the two
20 offset injection wells are turned back on and injection
21 operations are resumed.

22 Q. Who are the individuals that on behalf of
23 Marathon have committed that company to the remedial
24 work proposed in this exhibit?

25 A. Shown here are signatures from the Reservoir

1 Engineering Supervisor, the Operations Engineering
2 Supervisor and the Engineering Manager.

3 Q. In your opinion as a reservoir engineer, are
4 the remedial workover procedures recommended for the
5 McDonald State Number 15 efficient, adequate and
6 appropriate in the event of breakthrough fluids from
7 the waterflood project?

8 A. Yes, they are.

9 Q. And would you recommend to the Examiner that
10 he adopt these procedures?

11 A. Yes, I do.

12 Q. Let's turn now, sir, to the Exhibit Number
13 10. Would you identify that for us?

14 A. Okay, Exhibit Number 10 is a determination of
15 reserve value in 1993 dollars.

16 What I'm wanting to show here is the
17 remaining reserves left in Well Number 15, and I used a
18 gas price of \$1.50 per MCF, which gives you a value of
19 those reserves in 1993 current dollars of \$603,000.

20 Due to Well Number 33 having injection fluids
21 moved above the top of the Queen, that well has been
22 shut in since 1-92.

23 Those secondary reserves which were obtained
24 volumetrically using the same parameters that were used
25 to put together the flood for the initiation of the

1 McDonald State Waterflood yield secondary reserves for
2 that pattern area which is shown back on Exhibit Number
3 1 of 299,000 barrels of oil for that pattern area,
4 based on volumetrics and recovery factors.

5 Using \$18.50 a barrel for oil, that gives you
6 \$5.5 million in value for that pattern area that that
7 well is not injecting into at this time.

8 Q. The Jalmat gas reserves remaining in the 15
9 well that are at risk if you have to kill the well do
10 the remedial work and cannot retrieve or obtain
11 production?

12 A. Re-establish production, that is correct.

13 Q. And it's approximately 400,000 MCF?

14 A. That is correct.

15 Q. Currently, what are the oil reserves at risk
16 that you're not going to be able to recover with an
17 efficient secondary recovery project if you have to
18 keep the Number 33 well shut in?

19 A. Potentially 299,000 barrels of oil, based on
20 volumetrics.

21 Q. Have you done a literature search, if you
22 will, or an effort to determine whether or not
23 operators in this area have had any experience with
24 trying to kill low-volume, late-life Jalmat gas wells
25 to do workover or remedial work and then try to restore

1 production?

2 A. I did a search in the area. Our operating of
3 Jalmat wells is minimal at best. We're not that big of
4 a player.

5 And one of the things I can use to draw an
6 analogy to that has drawn some concern from Marathon's
7 management is that we had a Eumont well to the north,
8 and that well was a dual Eumont-Grayburg-San Andres
9 producer that went into the Amerada Hess unit, and we
10 opted to keep that well and pay the wellbore penalty.

11 And subsequently we had to go in and squeeze
12 off and plug out of the Grayburg-San Andres pool and
13 then re-establish production as a single Eumont well.

14 That well was a top allowable 600-MCF-a-day
15 well, and subsequently after kill fluids and workover
16 operations, a year later we've only got that well back
17 up to about 320 to 330 MCF a day, and we have not
18 hardly recovered hardly any of the amount of fluids
19 that we used to do the remedial workover on that well.

20 Q. Is that type of risk applicable to what you
21 would use to do for the 15 well in order to undertake
22 remedial work now?

23 A. Yes, sir, that's what draws our concerns with
24 working on the well right away.

25 Q. Do you have cement bond logs on the three

1 injectors that are the topic of this case, Mr. Price?

2 A. Yes, sir, I do. Exhibit Number 11 is a
3 cement bond log shown for Well Number 33, which is also
4 shown, its location, on the plat.

5 As I stated before, through profile logs a
6 slight channel was established up to the Lower Seven
7 Rivers Pool.

8 Looking at the bond log, it calculates out to
9 be 100- to 80-percent bond from that interval, on up to
10 the top of the South Eunice pool and on up through the
11 Jalmat pool.

12 So I believe in my technical opinion that
13 there's sufficient bond indicated with the bond log to
14 contain those fluids no higher than where they are
15 right now, and how those fluids got to the Lower Seven
16 Rivers Pool was probably due to initial acidizing of
17 the well upon initial completion of the well.

18 Also Exhibit Number 12 is the bond log for
19 Well Number 34, which is also shown colored on the plat
20 to give you reference of its location.

21 And there again, the bond log exhibits
22 excellent bond across intervals of interest. These are
23 all new-drill wells that were drilled in 1991. The
24 bottom 400 foot of all the casing was sandblasted, and
25 that warrants the good cement bond that you see here.

1 And Exhibit Number 13, again, is the bond log
2 for the last well in question, which is Well Number 40,
3 which there again is also colored and shown on the
4 reference plat.

5 And there again, you see very sufficient bond
6 log across the intervals of interest in question.

7 Q. Based upon your studies, do you have an
8 opinion, Mr. Price, as to whether or not the weak link,
9 if you will, between the Queen flood and the Jalmat gas
10 is the Number 15 well?

11 A. Yes, it should be.

12 Q. It appears to you to be good reservoir
13 separation between the Queen pool and the Jalmat so
14 that if there is any breakthrough, the only point at
15 which that is going to occur in this immediate vicinity
16 would be the 15 well?

17 A. Yes, sir, it sure will. Based on the bond
18 logs on the three wells, the mechanical isolation and
19 integrity of the wells should not be in question, and
20 that the weak link should be Number 15 due its
21 mechanical integrity.

22 Q. And the weak link, then, is a well that you
23 control, operate and have committed to a procedure to
24 fix that well in the event it becomes a problem well?

25 A. Yes, we have.

1 MR. KELLAHIN: That concludes my examination
2 of Mr. Price.

3 We move the introduction of his Exhibits 1
4 through 13.

5 EXAMINER CATANACH: Exhibits 1 through 13
6 will be admitted as evidence.

7 EXAMINATION

8 BY EXAMINER CATANACH:

9 Q. Mr. Price, have you calculated how many --
10 what's the remaining productive life of the Number 15
11 well in years or months?

12 A. If you look on the decline curve for Number
13 15, it projects out to be about the year 2011, so that
14 would probably give it about a 17-, 18-year economic
15 life remaining, based on decline curve analysis.

16 Q. Have you done any calculations to determine
17 how long it would take for injected fluid to reach the
18 Number 15 well if you were allowed to inject into that
19 well?

20 A. I talked to our people in Littleton, and the
21 way that volume -- the way that was established, that
22 channel was from the profile logs, and that's using
23 radioactive tracer and monitoring where the fluid
24 movements are.

25 And it's very hard to quantify an actual

1 amount of barrels of fluid, because you're measuring
2 just radioactive intensity, because I questioned that,
3 if there was some way I could put a number on the
4 amount of volume of barrels of fluid that moved into
5 that zone.

6 And so technically I did not feel very
7 comfortable with trying to generate any kind of a
8 number on how much volume of fluid was moving into that
9 zone or when we could expect breakthrough in that
10 offset well.

11 The distance between Number 15 and Well
12 Number 33 is 460 feet.

13 Q. If you do experience breakthrough in the
14 Number 15 well, are the chances of a successful squeeze
15 job diminished because of that, as opposed to doing it
16 at this point in time?

17 A. Not in my opinion, no. I mean, if it is
18 going to be a problem, the problem is already induced,
19 and whatever injected fluids enter that wellbore
20 shouldn't make the chances of salvaging that well any
21 greater or any less.

22 Q. Would you have significant pressure in that
23 wellbore if you have breakthrough?

24 A. Probably not, just due to the other three
25 producers offsetting 33. You have take points.

1 They're all open in the Lower Seven Rivers and the zone
2 in question. And obviously, subsequently we would shut
3 down injection immediately, so that should relieve any
4 pressure or dissipate into the reservoir.

5 Since you do not have any injectors coming at
6 you in that location 15 from the east, heading west,
7 there shouldn't be any problem.

8 Q. Now, your reserve estimate on the additional
9 oil to be recovered in that pattern unit --

10 A. Yes, sir.

11 Q. -- that's solely based on the Seven Rivers
12 zone?

13 A. No, sir, that is estimated on the Queen,
14 because that well is shut in due to the water being --
15 whatever amount of fluid being above the Lower Seven
16 Rivers.

17 So that is the Queen reserves, but we
18 attribute those reserves, because that well's been
19 drilled, and like I said, it's been shut in since
20 January of 1992, so it's essentially to us an
21 inactively useful injector at this point in time.

22 Q. I'm sorry, the Number 3 was shut in for what
23 reason?

24 A. Thirty-three?

25 Q. Yeah.

1 A. It was shut in because it was in violation of
2 the original Order where Arco put stipulations on 33,
3 34 and 40, based on the profile of -- there was a
4 slight channel or migration of fluids above the top of
5 the Queen in that well, so hence that well was shut in.

6 And then negotiations were taken over with
7 Arco, because we could foresee the long-term future of
8 this flood, that this was always going to be a problem
9 for them. So then we took action to go ahead and try
10 to trade with Arco, to get control and operatorship of
11 the well.

12 Q. If you chose to start injecting into the 33,
13 could you do so?

14 A. Yes, we could. I believe the last current
15 injection rate, Number 33 when it was shut in, was
16 approximately 140 to 150 barrels per day.

17 MR. KELLAHIN: Well, if we commence injection
18 now, we're still in violation of this last Order.

19 THE WITNESS: Oh, that is correct, that is
20 correct. The Order on the last one was in reference to
21 Well Number 30, which is back over on the southwest
22 portion of the unit.

23 MR. KELLAHIN: I need to give you the
24 original Order, Mr. Examiner, because the A Order
25 addressed increasing the injection interval above the

1 top of the Queen for the Number 30 well.

2 THE WITNESS: That is correct.

3 MR. KELLAHIN: Here's the original Order,
4 R-9503, which shows you the stipulations on these three
5 injectors, whereby we're limited to the top of the
6 Queen. And although there's another hundred feet of
7 the pool, we're precluded at this time from utilizing
8 it.

9 Q. (By Examiner Catanach) Okay, injection was
10 limited -- Well, it should not extend past the top of
11 the Queen, because that's the limitation --

12 A. Yeah, that is correct.

13 MR. KELLAHIN: Yes, sir.

14 Q. (By Examiner Catanach) So you have not been
15 able to inject into the Number 33 well?

16 A. That is correct.

17 Q. How far does that channel run?

18 A. That channel is up to -- if I can direct your
19 attention, I guess I can use the bond log on Well
20 Number 33?

21 MR. STOVALL: Exhibit 11?

22 THE WITNESS: Yes, sir, Exhibit 11.

23 And you see that the Lower Seven Rivers is
24 projected on here to be at 3660, and based on the
25 tracer and the temperature profiles around that well,

1 we have fluid movement up to 3655.

2 Q. (By Examiner Catanach) If the Application in
3 this case for the Number 33 is denied as to extending
4 it to the top of the Seven Rivers, what are the plans
5 to do with Number 33 well?

6 A. That puts us in a predicament of going in and
7 trying to work on that well, which is a slight channel
8 of best, so squeezing may or may not work on that well.
9 That's been the condition all along that we had with
10 Arco. I mean, that was induced by treatment.

11 The injectivity of these wells on this part
12 of the lease is not as good as like down on the western
13 half of the southwestern part. They're probably going
14 to need some remedial treatment of some type to keep up
15 injection or to increase injection.

16 And that's the reason why we haven't been
17 aggressively pursuing 34 and 40, is we don't want to
18 induce the same type of problem in 34 and 40 that we've
19 incurred in 33 and subsequently had the well shut in
20 and definitely be of no utility to us.

21 Q. Now, you say you've had experience in
22 squeezing wells in the Eumont. Is this a typical
23 scenario? I mean --

24 A. That's about all the experience I could draw
25 on.

1 You know, a lot of the reports that I have
2 access to do not have a lot of detailed information on
3 previous before and after. And like I said, that's
4 where a lot of concerns comes from, from my management
5 and myself, as being involved with that well, taking a
6 good well and really making it a lesser producer and
7 somewhat risking, maybe, the ultimate recoverable
8 reserves.

9 EXAMINER CATANACH: I have nothing further.

10 MR. KELLAHIN: Okay. I'd like to call at
11 this time Mr. Carlson.

12 May the record reflect, Mr. Examiner, that
13 Mr. Carlson has been qualified as an expert and
14 continues to so testify in this case?

15 EXAMINER CATANACH: The record shall so
16 reflect.

17 ERIC CARLSON,
18 the witness herein, after having been first duly sworn
19 upon his oath, was examined and testified as follows:

20 DIRECT EXAMINATION

21 BY MR. KELLAHIN:

22 Q. Mr. Carlson, I would like to ask you a few
23 summary questions about your geology.

24 I don't propose to have you go into detail
25 about your displays. I thought what we would do is

1 identify each of them for the record, and then let me
2 come back and ask you my summary questions insofar as
3 your geology gives us information concerning the
4 subject at hand.

5 All right, sir?

6 A. (Nods)

7 Q. So for the record, let's go through these
8 quickly and have you identify for us first of all what
9 is marked as Exhibit Number 14.

10 A. Exhibit Number 14 is a structure map on the
11 top of the Lower Seven Rivers "A" sand. It was entered
12 into a hearing last year in March, and it was used
13 simply to establish that there is very little structure
14 on the lease but that we used it to show oil in Number
15 30 on the top of the structure, and in the lower parts
16 of the structure around Well Number 33.

17 Q. Okay, identify and describe Exhibit 15.

18 A. Exhibit Number 15 is a net sand map for the
19 Lower Seven Rivers "A" sand. And what it shows is that
20 there is net sand basically across the entire lease.
21 However, the sand is so thin that by itself it's a
22 noncommercial packet.

23 Q. Okay, Exhibit 16?

24 A. Exhibit Number 16 is another one that we've
25 submitted previously. It is a computer-processed log

1 which indicates that the Lower Seven Rivers, that there
2 is porosity, there is sand, and there is oil present in
3 the Lower Seven Rivers.

4 Q. Okay, Exhibit Number 17?

5 A. Exhibit Number 17 is a core from the Number 1
6 well, Account Number 1 A. It's indicated on a brown
7 dot on our location map.

8 And in this core we looked at the Lower Seven
9 Rivers particularly, and we established that there is
10 oil in the Lower Seven Rivers, that it's just a couple
11 feet thick, and that above the Lower Seven Rivers the
12 dolomite found above it is tombstone, there's no oil
13 saturation, and there's no permeability.

14 So we established that effectively the
15 formation above the Lower Seven Rivers is a seal.

16 Q. Let me stop you for a moment there. When you
17 look at the geologic integrity between the top of the
18 pool involved and the base of the Jalmat, when we look
19 at the production within the lower pool and its
20 relationship to the gas pool, give us a sense of how
21 impermeable, adequate or efficient that barrier is that
22 separates the two pools.

23 A. We believe that barrier is very efficient,
24 that it is the caprock or seal for the oil pools in the
25 Queen pool -- or South Eunice pool.

1 Q. And is that a consistent barrier that we find
2 throughout the flood area for this project?

3 A. Yes, sir, this dolomite is consistent in
4 thickness. It varies only by ten feet over an area of
5 about three or four townships at least.

6 Q. Direct your attention to Exhibit Number 18.
7 Identify and describe that display for us.

8 A. Exhibit Number 18 is an exhibit we prepared
9 for a hearing at the inauguration of waterflood.

10 Once again, it is a lithology description
11 from the Number 15 well. It's indicated in orange on
12 all your displays.

13 And what that establishes is where I picked
14 the top of the Lower Seven Rivers in this well, and
15 also between the Lower Seven Rivers and the top of the
16 South Eunice pool. If you look for the dolomite and
17 shale lines in the key to the right, you'll see them
18 also in the section between the Lower Seven Rivers "A",
19 marked in red, and the top South Eunice pool.

20 This description from this well shows that in
21 the Number 15 well we also have tombstone.

22 Q. What's the significance of the yellow
23 shading?

24 A. The yellow shading simply shows where the
25 Lower Seven Rivers "A" sand is in the Number 15 well.

1 Q. All right. Let me have you turn now to
2 Exhibit 19.

3 A. We did make one new exhibit for this hearing,
4 and what I've done is, I've shown with Exhibit 19 a
5 stratigraphic cross-section located south to north from
6 Well 33, including 34 and north to number 40. You see
7 those dots colored appropriately on your location map.

8 The vertical exaggeration is nine, and you
9 can see the vertical scale.

10 And what that shows, again, you can zero in
11 on the Lower Seven Rivers A, which I've marked in red,
12 and the top of the South Eunice pool. These are all
13 density neutron logs. You can see good tombstone
14 dolomite between these two horizons and a few shale
15 breaks in there as well, effectively making a very
16 impermeable seal between the oil reservoirs in the
17 Queen and the noncommercial reservoir and the Lower
18 Seven Rivers "A" and all the gas reservoirs in the
19 Jalmat above it.

20 Q. Do you continue to conclude and believe, as
21 you did in the earlier hearings, that there is good
22 reservoir continuity in this area, making the Upper
23 Queen a very good floodable zone leading to additional
24 oil recovery out of that reservoir?

25 A. My conclusions have not changed.

1 Q. Do your conclusions continue to be that these
2 three injector wells are essentially injector wells in
3 order to give you the opportunity to recover additional
4 oil in the pool that you would not otherwise recover?

5 A. Yes, sir.

6 MR. KELLAHIN: That concludes my examination
7 of Mr. Carlson.

8 We would move the introduction of his
9 Exhibits 14 through 19.

10 EXAMINER CATANACH: Exhibits 14 through 19
11 will be admitted as evidence.

12 EXAMINATION

13 BY EXAMINER CATANACH:

14 Q. I just want to verify what I thought I heard,
15 Mr. Carlson. Between the top of the Seven Rivers "A"
16 zone and the Jalmat Pool, there is some sort of
17 geologic barrier in there?

18 A. That is correct. Just to kind of zero in on
19 the lithology log again, remember, little tiny dots are
20 sand, fills are solid lines, and then the dolomite are
21 those rhombohedra.

22 And what we see is, above the top of the
23 South Eunice pool, in the Lower Seven Rivers, you see
24 lots of sands from the Jalmat sands. Okay. They're
25 way up there, though. And down here in the Queen also

1 we see a lot of sand.

2 The Lower Seven Rivers "A" is marked. Once
3 again, when we first made this display we considered it
4 noncommercial and not even worth mentioning on this
5 display.

6 However, you can see where it is at 3695.
7 Between 3695 and the top of the pool, or the base of
8 the Jalmat, if you will, you'll see you have about 70
9 percent dolomite and some shale in there as well.

10 Q. It's your opinion that that's impermeable to
11 fluid migration?

12 A. Absolutely, absolutely impermeable. The core
13 data from Exhibit 17 shows that we have no oil
14 saturation whatsoever in that dolomite, not a trace.

15 EXAMINER CATANACH: Okay, I have nothing
16 further.

17 I have one more question of Mr. Price, if I
18 may.

19 MR. KELLAHIN: All right, sir.

20 DONALD PRICE (Recalled),
21 the witness herein, having been previously duly sworn
22 upon his oath, was examined and testified as follows:

23 EXAMINATION

24 BY EXAMINER CATANACH:

25 Q. Mr. Price, have you quantified -- You gave me

1 a figure for the reserves in that pattern area, the
2 Number 33 well.

3 A. Okay.

4 Q. Have you broken that out according to zones,
5 or have you an estimate of what the Seven Rivers "A"
6 zone might contribute to those reserves?

7 A. To tell you the truth, the number that you
8 see there, the 299,000 barrels of oil, is just for the
9 Queen.

10 Q. That's for the Queen?

11 A. That is for the Queen. The Lower Seven
12 Rivers wasn't even figured into that number.

13 Q. Do you have any estimate what the Seven
14 Rivers might bring additionally?

15 A. Not at this time.

16 Based on the footage and the -- just using a
17 ratio of footage for that Lower Seven Rivers versus the
18 Queen pool, I would -- and the number that you see
19 there for that pattern, I would probably think maybe
20 30,000, 40,000 barrels of oil would probably be a
21 reasonable number for that stringer, across that
22 pattern area.

23 And that's just using -- knowing my knowledge
24 of the footage that we had in that pattern, versus the
25 footage that you see in the Lower Seven Rivers.

1 EXAMINER CATANACH: Nothing further.

2 EXAMINATION

3 BY MR. KELLAHIN:

4 Q. One point of clarification, I guess, for me.

5 Apart from an estimate on the Seven Rivers
6 reserves in the pattern, the 30,000 or 40,000, you
7 still have at risk, though, the 300,000 barrels of oil
8 that you can't recover in the Queen because you've got
9 this issue with the Number 15 well?

10 A. That is correct, yeah, and that's the
11 reserves I attributed because they're not recoverable
12 at this point in time even though we have the well
13 drilled, because we're not allowed to inject into it.

14 MR. KELLAHIN: Okay, we have nothing further
15 in this case, Mr. Examiner.

16 EXAMINATION

17 BY MR. STOVALL:

18 Q. I have one question on that exhibit that we
19 were just looking at. You're talking about 402,000 MCF
20 of gas? That's the 15, right?

21 A. That is correct.

22 Q. That's remaining in place even if you have
23 the problem that you anticipate, that eventually you
24 get a water breakthrough in there and that you have to
25 go in and do some remedial work and lose some

1 production. You'll recover some of that 420,000 MCF;
2 is that --

3 A. That feasibly could be, yes. I mean, you're
4 taking into account, too, another intangible that we
5 had, was just the condition of the wellbore. It's a
6 1930 wellbore. It's got rip casing, a cement-plug
7 tubing. I mean, you could get into a run of mechanical
8 problems and lose the whole well.

9 But you're correct, if you go in and
10 establish -- and try to re-establish production, even
11 if it's of lesser extent, you'd -- probably the
12 proportion you're going to lose --

13 Q. And you get some of that -- Excuse me, go
14 ahead.

15 A. -- some long-term recovery and reserves.

16 Our whole contention is, is that instead of
17 going out and fixing the well right away and correcting
18 a problem that may or may not be there in risking those
19 reserves, that we're not going to do any more damage to
20 the well if we do see the water break through and then
21 go repair the problem at that point in time. We
22 haven't done any more extent damage to the reservoir.

23 Q. But you'll -- In all likelihood, you will
24 recover some of that remaining gas in place before you
25 see a water breakthrough, even?

1 A. That is correct, that is correct.

2 Q. So this is a high number on what you could
3 potentially lose?

4 A. Yes, yes.

5 MR. STOVALL: Okay.

6 FURTHER EXAMINATION

7 BY EXAMINER CATANACH:

8 Q. Let me ask you this: If you have, say,
9 breakthrough four or five years down the road, will the
10 decision to repair the well -- will the economics have
11 anything to do with whether to repair the well at that
12 time or not?

13 A. I couldn't say. If it's in the Order, we
14 would probably repair it. I mean, obviously, if it's
15 at its economic limit and it's going off the projected
16 decline that we have, the cost to repair the well is
17 kind of -- I can give you a wide range, what it's going
18 to take the cost.

19 We go in there and not have any problems,
20 fishing the tubing, getting the packer out, it probably
21 -- You know, the cost isn't an issue. It's just,
22 what's the best way to recover the reserves on a risk
23 basis, is the way we looked at it.

24 You could have prolonged time fishing tubing,
25 or you could go in there and get it all out pretty

1 quick, and it may not be as costly on an economic, just
2 dollars, basis.

3 EXAMINER CATANACH: I have nothing further.

4 MR. KELLAHIN: Finally, I guess Exhibit 20
5 needs to be marked. That's the certificate of mailing
6 of notification. There were no objections filed, as
7 best I know, to granting this Application, by any of
8 the offset operators notified. And I need to stamp
9 that for you, and I will do so at the break.

10 EXAMINER CATANACH: Okay. There being
11 nothing further, Case 10,704 will be taken under
12 advisement.

13 (Thereupon, these proceedings were concluded
14 at 11:35 a.m.)

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1 CERTIFICATE OF REPORTER

2
3 STATE OF NEW MEXICO)
4) ss.
COUNTY OF SANTA FE)

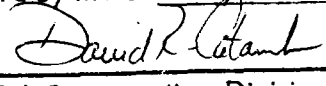
5
6 I, Steven T. Brenner, Certified Court
7 Reporter and Notary Public, HEREBY CERTIFY that the
8 foregoing transcript of proceedings before the Oil
9 Conservation Division was reported by me; that I
10 transcribed my notes; and that the foregoing is a true
11 and accurate record of the proceedings.

12 I FURTHER CERTIFY that I am not a relative or
13 employee of any of the parties or attorneys involved in
14 this matter and that I have no personal interest in the
15 final disposition of this matter.

16 WITNESS MY HAND AND SEAL April 18th, 1993.

17
18 
19 STEVEN T. BRENNER
CCR No. 7

20 My commission expires: October 14, 1994
21

22 I do hereby certify that the foregoing is
23 a complete record of the proceedings in
the Examiner hearing of Case No. 1004,
24 heard by me on April 8 1993.
25 , Examiner
Oil Conservation Division